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$n = 11$

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|---|---|---|---|---|---|---|---|---|---|---|
| 181 | 194 | 207 | 220 | 233 | 114 | 127 | 140 | 153 | 166 | 179 |
| 193 | 206 | 219 | 232 | 124 | 126 | 139 | 152 | 165 | 178 | 180 |
| 205 | 218 | 231 | 123 | 125 | 138 | 151 | 164 | 177 | 190 | 192 |
| 217 | 230 | 122 | 135 | 137 | 150 | 163 | 176 | 189 | 191 | 204 |
| 229 | 121 | 134 | 136 | 149 | 162 | 175 | 188 | 201 | 203 | 216 |
| 120 | 133 | 146 | 148 | 161 | 174 | 187 | 200 | 202 | 215 | 228 |
| 132 | 145 | 147 | 160 | 173 | 186 | 199 | 212 | 214 | 227 | 119 |
| 144 | 157 | 159 | 172 | 185 | 198 | 211 | 213 | 226 | 118 | 131 |
| 156 | 158 | 171 | 184 | 197 | 210 | 223 | 225 | 117 | 130 | 143 |
| 168 | 170 | 183 | 196 | 209 | 222 | 224 | 116 | 129 | 142 | 155 |
| 169 | 182 | 195 | 208 | 221 | 234 | 115 | 128 | 141 | 154 | 167 |

# NOTE ON A MEMORY DEVICE FOR HYPERBOLIC FUNCTIONS.

By F. S. ELDER, Central High School, Kansas City, Mo.

Purely as a memory aid for expressing any hyperbolic function $\phi h(u)$ in terms of any other hyperbolic function $\psi h(u)$, I offer the following method which I never have seen in print.

Draw the customary right triangle $ABC$ right angled at $C$, as for the circular functions. Write $\psi h(u)$ and unity upon the same sides of the triangle as you would to show the corresponding circular function. Then take the triangle by the point $C$ and deform it until $B$ becomes the right angle. In this deformation, the two sides on which the numbers are written are supposed to retain their original length, while the third side is deformed (lengthened or shortened) and likewise in returning to the original form. Now compute the third side in terms of the other two and let the triangle recover its original shape. All the other hyperbolic functions, $\phi h(u)$, can now be written down directly in terms of $\psi h(u)$ by means of the same ratios of the sides of the original triangle that give the corresponding circular functions.

*Examples:* (1) If $\psi h(u)$ be $\tan h(u)$, write $AC = 1$, $BC = \tan h(u)$. Deform. Then $AB = \sqrt{1 - \tan^2 h(u)}$; now restore the triangle.

Then

$$\sin h(u) = BC/AB = \frac{\tan h(u)}{\sqrt{1 - \tan^2 h(u)}}, \quad \sec h(u) = AB/AC = \sqrt{1 - \tan^2 h(u)}, \text{ etc.}$$

(2) If $\psi h(u)$ be $\csc h(u)$, write $AB = \csc h(u)$; $BC = 1$. Deform. Then $AC = \sqrt{1 + \csc^2 h(u)}$. Restore.

Then

$$\cos h(u) = AC/AB = \frac{\sqrt{1 + \csc^2 h(u)}}{\csc h(u)}, \quad \tan h(u) = BC/AC = \frac{1}{\sqrt{1 + \csc^2 h(u)}}, \text{ etc.}$$